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स्व-धारक टेपर्स — आयाम

(तीसरा पुनरीक्षण)

Indian Standard

SELF-HOLDING TAPERS — DIMENSIONS

(Third Revision)

ICS 25.060.20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 2002

Price Group 5

Drills, Reamers and Threading Tools Sectional Committee, BP 10

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Drills, Reamers and Threading Tools Sectional Committee had been approved by the Basic and Production Engineering Division Council.

This standard was first published in 1963 and subsequently revised in 1973 to bring it in line with ISO/R 296. The second revision was taken up in 1986 to align it with ISO 296 : 1974 'Machine tools — Self- holding tapers for tool shanks' and DIN 228 (Teil 1 & Teil 2):1982 'Morse tapers and metric tapers, taper shanks and taper sockets'.

This revision was again taken up to align it with the latest version of its base standards that is ISO 296:1991 and DIN 228 (Teil 1 & Teil 2):1987. The title of the standard has been modified. This revision also includes the following modifications:

a) New types of shanks and sockets listed below have been included:
    1) External self-holding taper for tool shanks with tapped hole and coolant supply, Type AK.
    2) External self-holding tapers for tool shanks with tanged end and coolant supply, Type BK.
    3) Internal self-holding tapers for sockets with tapped hole and coolant supply, Type CK.
    4) Internal self-holding tapers for sockets with tanged end and coolant supply, Type DK.
b) In Table 1, l_2 dimensions for MT3, MT6 and metric tapers 80 to 200 have been modified.
c) In Table 3, dimensions Z has been modified.
d) In Annex A, the word 'recommended' has been included in the title and a clause **A-3** added.

In the preparation of this standard, considerable assistance has been derived from the following:

> ISO 296:1991 Machine tools — Self-holding tapers for tool shanks issued by International Organization for Standardization (ISO)
>
> DIN 228 Teil 1:1987 Morse tapers and metric tapers, taper shanks issued by Deutsches Institute für Normung (DIN)
>
> DIN 228 Teil 2:1987 Morse tapers and metric tapers, taper sockets issued by Deutsches Institut für Normung (DIN)

Indian Standard

SELF-HOLDING TAPERS — DIMENSIONS

(Third Revision)

1 SCOPE

1.1 This standard specifies the dimensions of Self-Holding Tapers with a small taper of about 4 to 5 percent classified, according to their use, into the three following categories:

a) Tapers for general use	No. 1 to 6 morse tapers
b) Smaller tapers	No. 4 and 6 metric and No. 0 morse
c) Larger tapers	No. 80 to 200 metric

1.2 This Indian Standard also specifies the dimension of grooves and holes necessary for the design of tapers for applications where coolant supply is required.

1.3 Recommended method of measuring tolerance on tapers is given in Annex A.

2 REFERENCES

The following Indian Standards contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
2102 (Part 1) : 1993	General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indications (*third revision*)
7615 : 1993	System of cone tolerances for conical work pieces from C=1:3 to 1 : 500 and lengths from 6 to 630 mm (*first revision*)

3 DIMENSIONS

3.1 External Self-Holding Tapers for Tool Shanks with Tapped Hole or Plain end, Type A — As given in Table 1.

3.2 External Self-Holding Tapers for Tool Shanks with Tanged End, Type B — As given in Table 2.

3.3 External Self-Holding Tapers for Tool Shanks with Tapped Hole and Coolant Supply, Type AK — As given in Table 1.

3.4 External Self-Holding Tapers for Tool Shanks with Tanged End and Coolant Supply, Type BK — As given in Table 2.

3.5 Internal Self-Holding Tapers for Sockets with Tapped Hole or Plain End, Type C — As given in Table 3.

3.6 Internal Self-Holding Tapers for Sockets with Tanged End, Type D — As given in Table 3.

3.7 Internal Self-Holding Tapers for Sockets with Tapped Hole and Coolant Supply, Type CK — As given in Table 3.

3.8 Internal Self-Holding Tapers for Sockets with Tanged End and Coolant Supply, Type DK — As given in Table 3.

4 TOLERANCES

4.1 Conicity Tolerances

The cone angle tolerances shall be as given in Tables 4 and 5.

4.2 Tolerances on Dimensions

If not specified, tolerances shall be of grade 'medium' as given in IS 2102 (Part 1).

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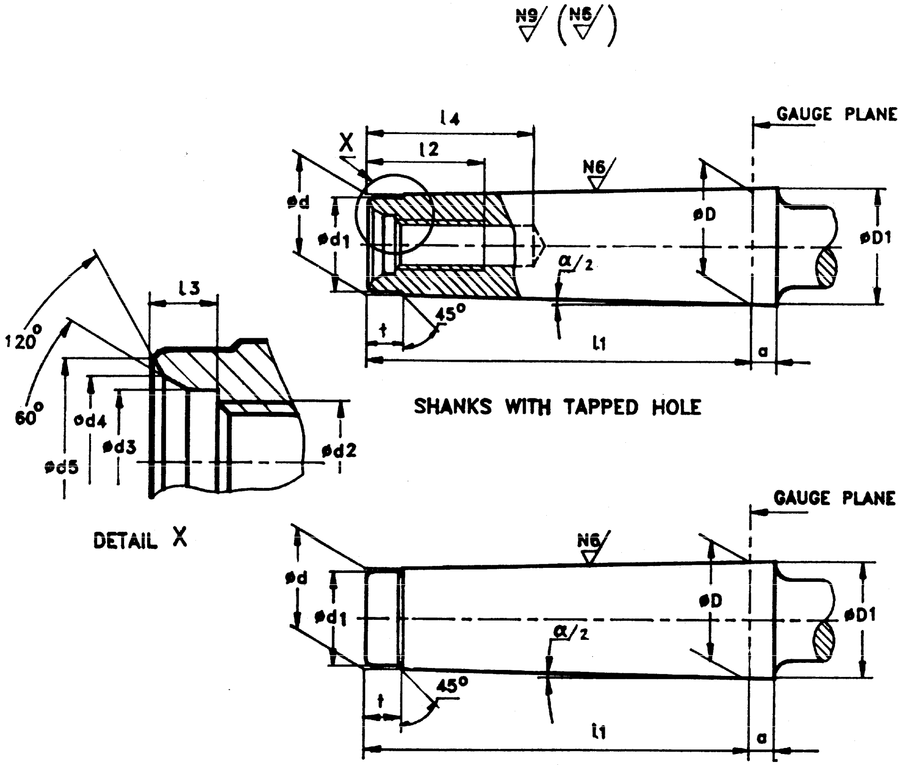
Table 1 Dimensions for External Self-Holding Tapers for Tool Shanks — Type A and Type AK

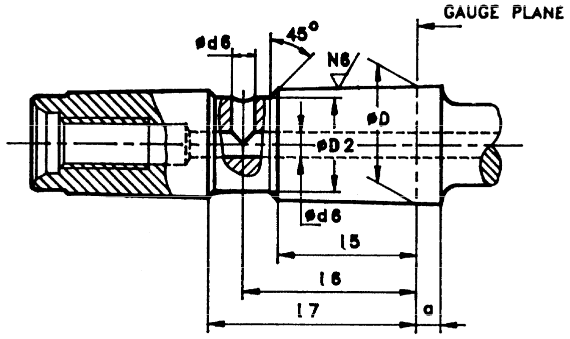
(*Clauses* 3.1 *and* 3.3)

All dimensions in millimetres.



SHANKS WITH PLAIN END

EXTERNAL SELF-HOLDING TAPERS FOR TOOL SHANKS WITH TAPPED HOLE OR PLAIN END-TYPE A



EXTERNAL SELF-HOLDING TAPERS FOR TOOL SHANKS WITH TAPPED HOLE AND COOLANT SUPPLY-TYPE AK

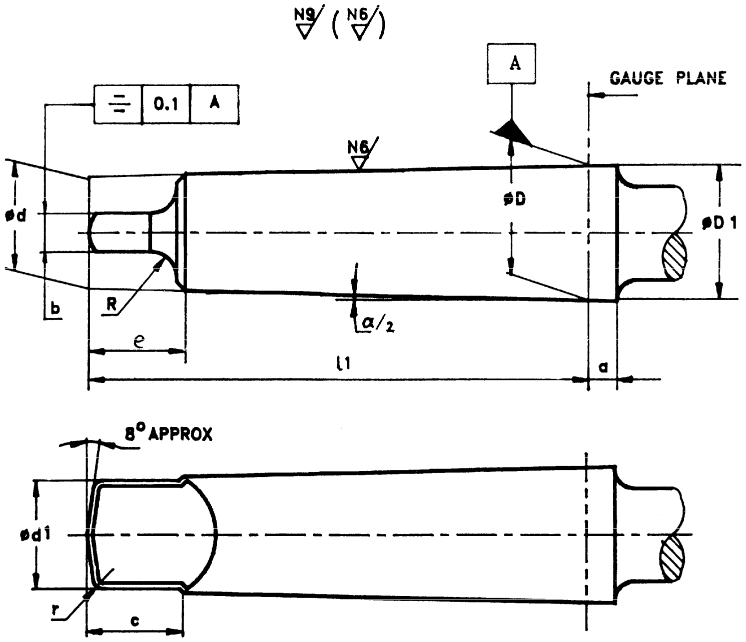
Designation of Taper— Types A & AK	Taper on Diameter	α/2	a		D	D_1[1] Approx	d[1] Approx	d_1 Max	d_2	d_3	d_4 Max	d_5 Max	l_1 Max	l_2 Min	t	l_3 +0.5 0	r	l_4 Min	D_2 0 −0.1	d_6	l_5 +1 0	l_6	l_7 0 −1
			Size	Tol																			
Metric 4 ME	1 : 20 = 0.05	1°25′56′′	2	+1 0	4	4.1	2.9	2.5	—	—	—	—	23	—	2	—	0.2	—	—	—	—	—	—
Metric 6 ME	1 : 20 = 0.05	1°25′56′′	3	+1 0	6	6.2	4.4	4	—	—	—	—	32	—	3	—	0.2	—	—	—	—	—	—
Morse 0 MK	1 : 19.212 = 0.052 05	1°29′27′′	3	+1.2 0	9.045	9.2	6.4	6	—	—	—	—	50	—	4	—	0.2	—	—	—	—	—	—
Morse 1 MK	1 : 20.047 = 0.049 88	1°25′43′′	3.5	+1.4 0	12.065	12.2	9.4	9	M6	6.4	8	8.5	53.5	16	5	4	0.2	22	—	—	—	—	—
Morse 2 MK	1 : 20.020 = 0.049 95	1°25′50′′	5	+1.4 0	17.780	18	14.6	14	M10	10.5	12.5	13.2	64	24	5	5	0.2	31.5	15	4.2	20	27	34
Morse 3 MK	1 : 19.922 = 0.050 20	1°26′16′′	5	+1.7 0	23.825	24.1	19.8	19	M12	13	15	17	81	24	7	5.5	0.6	33.5	21	5	29	36	43
Morse 4 MK	1 : 19.254 = 0.051 94	1°29′15′′	6.5	+1.9 0	31.267	31.6	25.9	25	M16	17	20	22	102.5	32	9	8.2	1	42.5	28	6.8	39	47	55
Morse 5 MK	1 : 19.002 = 0.052 63	1°30′26′′	6.5	+1.9 0	44.399	44.7	37.6	35.7	M20	21	26	30	129.5	40	10	10	2.5	52.5	40	8.5	51	60	69
Morse 6 MK	1 : 19.180 = 0.052 14	1°29′36′′	8	+2.3 0	63.348	63.8	53.9	51	M24	26	31	36	182	47	16	11.5	4	61.5	56	10.2	81	90	99
Metric 80 ME	1 : 20 = 0.05	1°25′56′′	8	+2.4 0	80	80.4	70.2	67	M30	32	38	45	196	59	24	14	5	76	—	—	—	—	—
Metric 100 ME	1 : 20 = 0.05	1°25′56′′	10	+2.8 0	100	100.5	88.4	85	M36	38	45	52	232	70	30	16	5	89	—	—	—	—	—
Metric 120 ME	1 : 20 = 0.05	1°25′56′′	12	+2.8 0	120	120.6	106.6	102	M36	38	45	52	268	70	36	16	6	89	—	—	—	—	—
Metric 160 ME	1 : 20 = 0.05	1°25′56′′	16	+3.2 0	160	160.8	143	138	M48	50	60	68	340	92	48	20	8	115	—	—	—	—	—
Metric 200 ME	1 : 20 = 0.05	1°25′56′′	20	+3.7 0	200	201	179.4	174	M48	50	60	68	412	92	60	20	10	115	—	—	—	—	—

[1] For D_1 and d, approximate values are given for guidance. (The actual values result from the actual values of a and l_1 respectively, taking into account taper on diameter and basic size D).

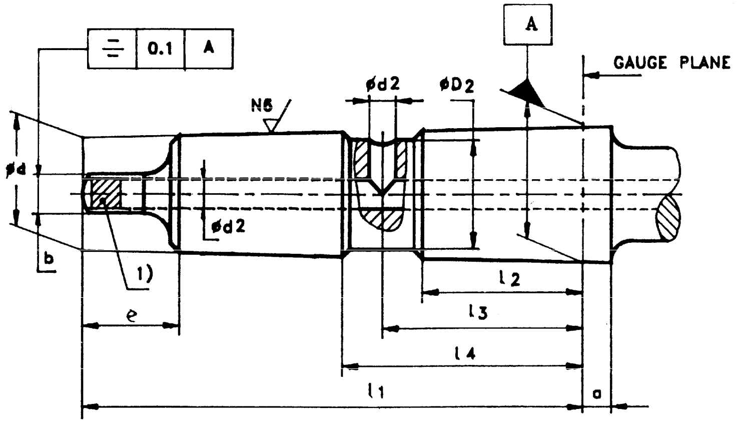
Table 2 Dimensions for External Self-Holding Tapers for Tool Shanks — Type B and Type BK

(*Clauses* 3.2 *and* 3.4)

All dimensions in millimetres.



EXTERNAL SELF-HOLDING TAPERS FOR TOOL SHANKS WITH TANGED END-TYPE B



EXTERNAL SELF-HOLDING TAPERS FOR TOOL SHANKS WITH TANGED END AND COOLANT SUPPLY-TYPE BK

Designation of Taper—Types B & BK	Taper on Diameter	$\alpha/2$	a		D	D_1[1] Approx	d[1] Approx	d_1 Max	L_1 0 −1	c[2]	b h13	e[2] Max	R Max	r Approx	D_2	d_2	l_2	l_3	l_4 0 −1
			Size	Tol															
Morse 0 MK	1: 19.212 = 0.052 05	1° 29′ 27′′	3	+ 1.2 0	9.045	9.2	6.1	6	56.5	6.5	3.9	10.5	4	1	—	—	—	—	—
Morse 1 MK	1 : 20.047 = 0.049 88	1° 25′ 43′′	3.5	+ 1.4 0	12.065	12.2	9	8.7	62	8.5	5.2	13.5	5	1.2	—	—	—	—	—
Morse 2 MK	1 : 20.020 = 0.049 95	1° 25′ 50′′	5	+ 1.4 0	17.780	18	14	13.5	75	10	6.3	16	6	1.6	15	4.2	20	27	34
Morse 3 MK	1 : 19.922 = 0.050 20	1° 26′ 16′′	5	+ 1.7 0	23.825	24.1	19.1	18.5	94	13	7.9	20	7	2	21	5	29	36	43
Morse 4 MK	1 : 19.254 = 0.051 94	1° 29′ 15′′	6.5	+ 1.9 0	31.267	31.6	25.2	24.5	117.5	16	11.9	24	8	2.5	28	6.8	39	47	55
Morse 5 MK	1 : 19.002 = 0.052 63	1° 30′ 26′′	6.5	+ 1.9 0	44.399	44.7	36.5	35.7	149.5	19	15.9	29	10	3	40	8.5	51	60	69
Morse 6 MK	1 : 19.180 = 0.052 14	1° 29′ 36′′	8	+ 2.3 0	63.348	63.8	52.4	51	210	27	19	40	13	4	56	10.2	81	90	99
Metric 80 ME	1 : 20 = 0.05	1° 25′ 56′′	8	+ 2.4 0	80	80.4	69	67	220	24	26	48	24	5	—	—	—	—	—
Metric 100 ME	1 : 20 = 0.05	1° 25′ 56′′	10	+ 2.8 0	100	100.5	87	85	260	28	32	58	30	5	—	—	—	—	—
Metric 120 ME	1 : 20 = 0.05	1° 25′ 56′′	12	+ 2.8 0	120	120.6	105	102	300	32	38	68	36	6	—	—	—	—	—
Metric 160 ME	1 : 20 = 0.05	1° 25′ 56′′	16	+ 3.2 0	160	160.8	141	138	380	40	50	88	48	8	—	—	—	—	—
Metric 200 ME	1 :20 = 0.05	1° 25′ 56′′	20	+ 3.7 0	200	201	177	174	460	48	62	108	60	10	—	—	—	—	—

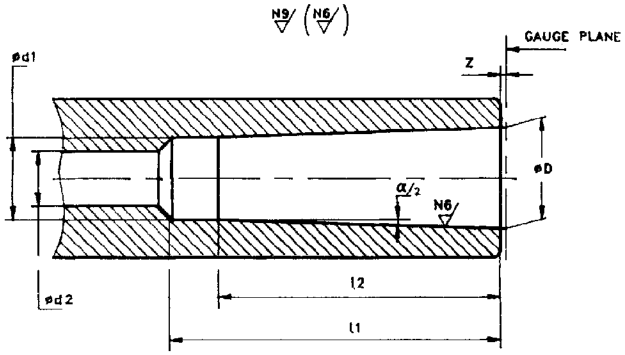
[1] For D_1 and d, approximate values are given for guidance. (The values result from the actual values of a and L_1 respectively, taking into account the taper on diameter and basic size D.)

[2] It is permissible to increase the length c over which the tang is turned to diameter d_1, but without exceeding e.

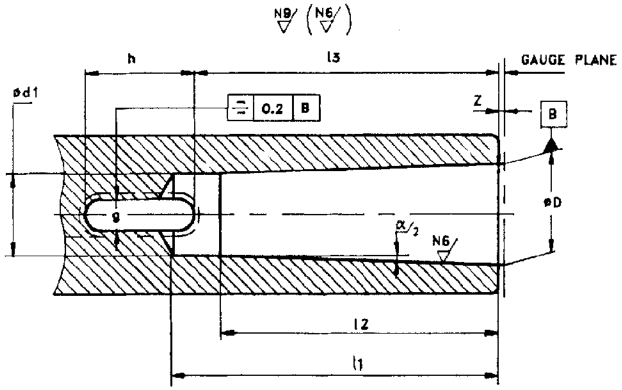
Table 3 Dimensions for Internal Self-Holding Tapers for Sockets-Types C, D, CK and DK

(*Clauses* 3.5, 3.6, 3.7 *and* 3.8)

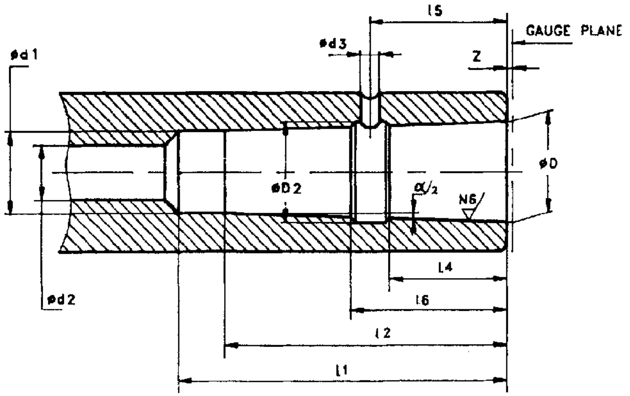
All dimensions in millimetres.



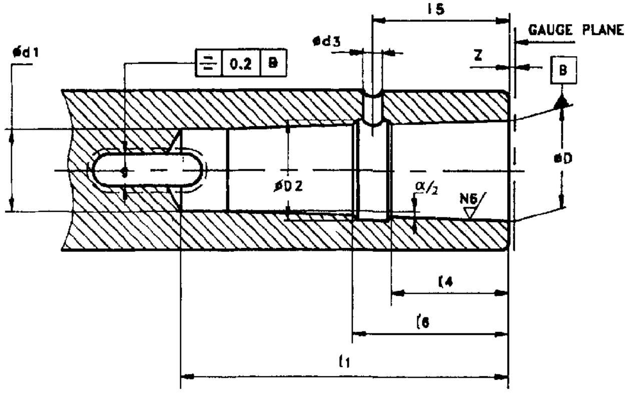
INTERNAL SELF-HOLDING TAPERS FOR SOCKETS WITH TAPPED HOLE OR PLAIN END-TYPE C



INTERNAL SELF-HOLDING TAPERS FOR SOCKETS WITH TANGED END-TYPE D



INTERNAL SELF-HOLDING TAPERS FOR SOCKETS WITH TAPPED HOLE AND COOLANT SUPPLY-TYPE CK



INTERNAL SELF-HOLDING TAPERS FOR SOCKETS WITH TANGED END AND COOLANT SUPPLY-TYPE DK

Designation of Taper—Types C, D, CK & DK	Taper on Diameter	$\alpha/2$	g A13	D	d_1 H11	d_2 *Min*	l_1 *Min*	l_2 Approx	l_3	h	D_2	d_3	l_4	l_5	l_6	Z 1)
Metric 4 Type C	1:20 = 0.05	1° 25′ 56′′	2.2	4	3	—	25	20	21	8	—	—	—	—	—	0.5
Metric 6 Type–C	1:20 = 0.05	1° 25′ 56′′	3.2	6	4.6	—	34	28	29	2	—	—	—	—	—	0.5
Morse 0 Type–C, D, CK & DK	1:19.212 = 0.052 05	1° 29′ 27′′	3.9	9.04	56.7	—	52	45	49	15	—	—	—	—	—	1
Morse 1 Type–C, D, CK & DK	1:20.047 = 0.049 88	1° 25′ 43′′	5.2	12.06	59.7	7	56	47	52	19	—	—	—	—	—	1
Morse 2 Type–C, D, CK & DK	1:20.020 = 0.049 95	1° 25′ 50′′	6.3	17.780	14.9	11.5	67	58	62	22	19.5	4.2	22	27	32	1
Morse 3 Type C, D, CK & DK	1:19.922 = 0.050 20	1° 26′ 16′′	7.9	23.825	20.2	14	84	72	78	27	24.5	5	31	36	41	1
Morse 4 Type–C, D, CK & DK	1:19.254 = 0.051 94	1° 29′ 15′′	11.9	31.267	26.5	18	107	92	98	32	32	6.8	41	47	53	1
Morse 5 Type–C, D, CK & DK	1:19.002 = 0.052 63	1° 30′ 26′′	15.9	44.399	38.2	23	135	118	125	38	44	8.5	53	60	67	1
Morse 6 Type C, D, CK & DK	1:19.180 = 0.052 14	1° 29′ 36′′	19	63.348	54.8	27	188	164	177	47	63	10.2	83	90	97	1
Metric 80 Type–C & D	1:20 = 0.05	1° 25′ 56′′	26	80	71.5	33	202	170	186	52	—	—	—	—	—	1.5
Metric 100 Type–C & D	1:20 = 0.05	1° 25′ 56′′	32	100	90	39	240	200	220	60	—	—	—	—	—	1.5
Metric 120 Type- C & D	1:20 = 0.05	1° 25′ 56′′	38	120	108.5	39	276	230	254	70	—	—	—	—	—	1.5
Metric 160 Type–C & D	1:20 = 0.05	1° 25′ 56′′	50	160	145.5	52	350	290	321	90	—	—	—	—	—	2
Metric 200 Type–C & D	1:20 = 0.05	1° 25′ 56′′	62	200	182.5	52	424	350	388	110	—	—	—	—	—	2

1) Z is the maximum permissible deviation, outwards only, of the position of the gauge plane related to the basic size D from the nominal position of coincidence with the leading face.

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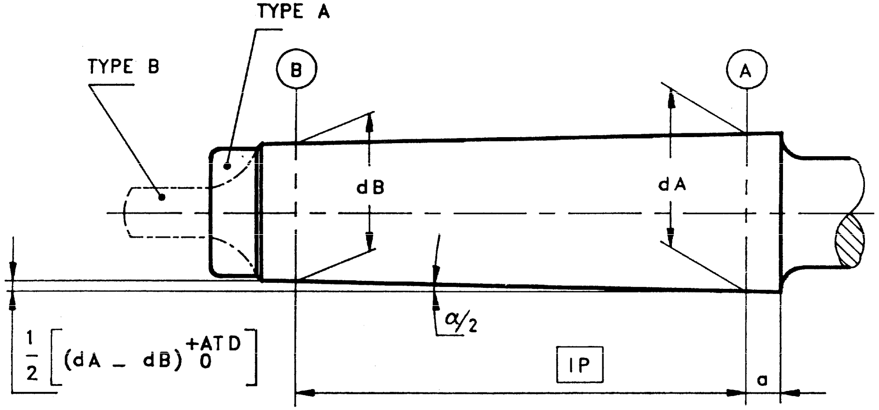
Table 4 Tolerances on External Self-Holding Tapers — Taper Shanks

(*Clause* 4.1)

All dimensions in millimetres.



		Metric Taper Shank, Type A Size		Morse Taper Shank, Types A, B, AK or BK Size						
		4	6	0	1	2	3	4	5	6
Taper on Diameter		1:20 = 0.05		1:19.212 =0.052 05	1.20.047 =0.049 88	1:20.020 =0.049 95	1:19.922 =0.050 20	1:19.254 =0.051 94	1:19.002 =0.052 63	1:19.180 =0.052 14
$d_A = D$		4	6	9.045	12.065	17.780	23.825	31.267	44.399	63.348
$d_A - d_B$		0.95	1.3	2.238	2.245	2.697	3.464	4.519	6.000	8.447
l_p		19	26	43	45	54	69	87	114	162
AT_D	AT4	0.002	0.003	0.003	0.004	0.004	0.004	0.005	0.006	0.006
	AT5	0.004	0.004	0.005	0.006	0.007	0.007	0.009	0.009	0.010
	AT6	0.006	0.007	0.009	0.009	0.011	0.011	0.014	0.014	0.016
	AT7	0.010	0.010	0.014	0.014	0.017	0.017	0.022	0.023	0.026
	AT8	0.015	0.016	0.022	0.023	0.027	0.028	0.035	0.036	0.041

		Metric Taper Shank, Types A or B Size				
		80	100	120	160	200
Taper on Diameter		1:20=0.05				
$d_A = D$		80	100	120	160	200
$d_A - d_B$		8.2	9.6	11	13.8	16.6
l_p		164	192	220	276	332
AT_D	AT3	0.004	0.005	0.006	0.006	0.007
	AT4	0.007	0.008	0.009	0.009	0.010
	AT5	0.010	0.012	0.014	0.014	0.017
	AT6	0.016	0.019	0.022	0.022	0.027
	AT7	0.026	0.031	0.035	0.035	0.042
	AT8	0.041	0.048	0.055	0.055	0.066

NOTE—The difference between the actual dimensions d_A and d_B in the measuring planes *A* and *B* shall not be less than the specified value $d_A - d_B$ and not more than $d_A - d_B + AT_D$. The tolerance AT_D is calculated on the basis of the taper angle tolerance *AT*, in accordance with the formula $AT_D = \frac{AT_\alpha}{16^6} \cdot l_p$ as per IS 7615.

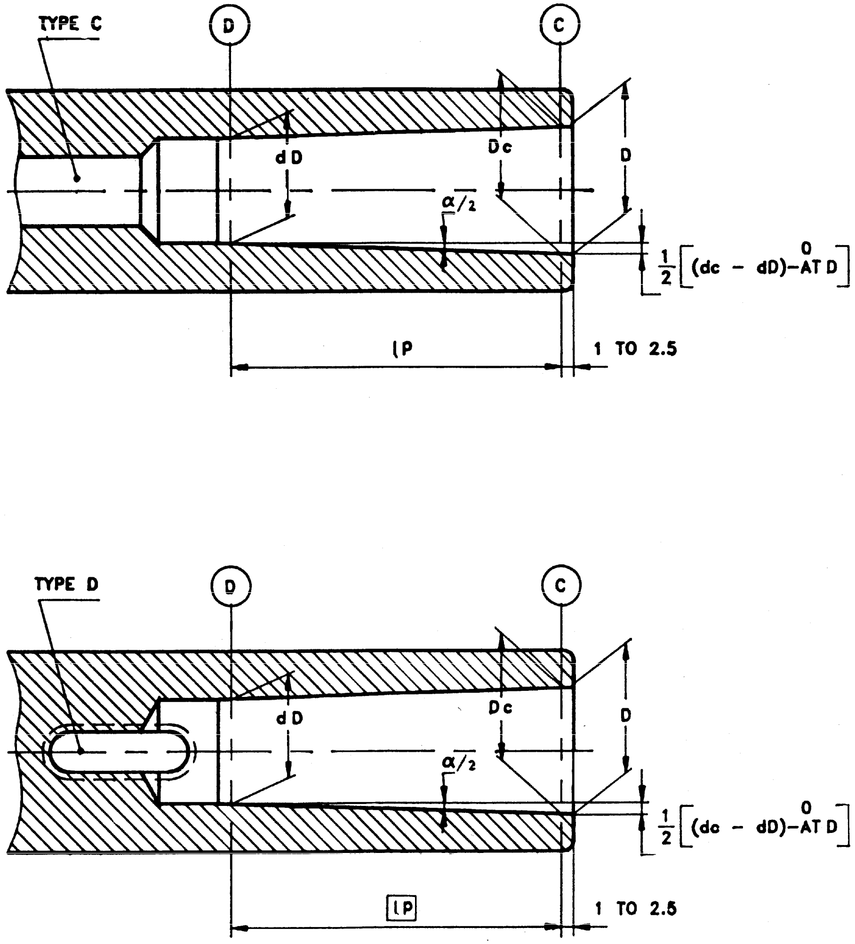
The measuring length l_p of the taper is selected in such a way that the distance of the measuring plane *B* from the smaller diameter of the taper is approximately the same as the distance '*a*' of the measuring plane *A* from the large diameter of the taper.

The tolerances of taper angle include tolerance on straightness of the generator and tolerance on the circularity (roundness).

Table 5 Tolerances on Internal Self-Holding Tapers — Tapers Sockets

(*Clause* 4.1)

All dimensions in millimetres.


TYPE C
D
C
d D
Dc
D
α/2
$\frac{1}{2}\left[(dc - dD) - AT\,D\right]^{0}$
lP
1 TO 2.5
TYPE D
D
C
d D
Dc
D
α/2
$\frac{1}{2}\left[(dc - dD) - AT\,D\right]^{0}$
lP
1 TO 2.5

TOLERANCE ON INTERNAL SELF-HOLDING TAPERS – TAPER SOCKETS

		Metric Taper Socket, Type C Size		Morse Taper Socket Types C, D, CK or DK Size						
		4	6	0	1	2	3	4	5	6
Taper on Diameter		1: 20 = 0.05		1:19.212 =0.052 05	1:20.047 =0.049 88	1:20.020 =0.049 95	1:19.922 =0.050 20	1:19.254 =0.051 94	1:19.002 =0.052 63	1:19.180 =0.052 14
D		4	6	9.045	12.065	17.780	23.825	31.267	44.399	63.348
$d_c - d_D$		0.8	1.2	2.134	2.195	2.647	3.414	4.467	5.895	8.238
l_p		16	24	41	44	53	68	86	112	158
AT_D	AT4	0.003	0.003	0.003	0.004	0.004	0.004	0.005	0.006	0.008
	AT5	0.004	0.005	0.005	0.006	0.007	0.007	0.009	0.009	0.013
	AT6	0.006	0.008	0.008	0.009	0.011	0.011	0.014	0.014	0.020
	AT7	0.010	0.012	0.013	0.014	0.017	0.017	0.022	0.022	0.032
	AT8	0.016	0.019	0.021	0.022	0.027	0.027	0.034	0.035	0.049

		Metric Taper Shank, Types C or D Size				
		80	100	120	160	200
Taper on Diameter				1:20=0.05		
D		80	100	120	160	200
$d_C - d_D$		8.2	9.6	11	13.8	16.6
l_p		164	192	220	276	332
AT_D	AT3	0.004	0.005	0.006	0.006	0.007
	AT4	0.007	0.008	0.009	0.009	0.010
	AT5	0.010	0.012	0.014	0.014	0.017
	AT6	0.016	0.019	0.022	0.022	0.027
	AT7	0.026	0.031	0.035	0.035	0.042
	AT8	0.041	0.048	0.055	0.055	0.066

NOTE—The difference between the actual dimensions d_C and d_D in the measuring planes C and D shall not be greater than the specified value $d_C - d_D$ and not less than $d_C - d_D - AT_D$. The tolerance AT_D is calculated on the basis of the taper angle tolerance AT, in accordance with the formula $AT_D = \frac{AT_\alpha}{16^6} \cdot l_p$ as per IS 7615.

The measuring length l_p of the taper has been shortened in comparison with taper shanks.

The tolerance of taper angle include tolerance on straightness of the generator and tolerance on the circularity (roundness).

ANNEX A

(*Clause* 1.3)

RECOMMENDED METHOD OF MEASURING TOLERANCE ON TAPERS

A-1 MEASURING INSTRUMENTS

It is recommended that for the inspection of tapers, the diameters should be measured with the help of optical measuring instruments or by the method of comparison with master gauges on comparators.

A-2 INSPECTION

The taper shank and sockets shall be inspected by the method of taking bearing. Thin layer of blue colour paste shall be applied for checking bearing seat. There shall be only one line of blue having a width 5 to 10 mm. A maximum of only one complete turn with backward and forward motions shall be done with the gauge for checking the bearing. There shall be minimum 60 percent bearing from the bigger diameter for accepting the taper shanks and sockets.

A-3 Other appropriate methods may be adopted as agreed to between manufacturer and customer.

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